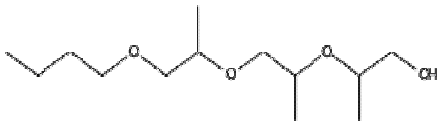
# Tripropylene Glycol n-Butyl Ether (TPnB) (CAS# 55934-93-5)

(Synonyms: TPnB or TPGnBE; TPGBE; [(butoxymethylethoxy)methylethoxy]propan-1-ol; Dowanol TPnB , ARCOSOLV® TPNB; Propanol, 2-(2-butoxymethylethoxy)methylethoxy.



**Tripropylene Glycol n-Butyl Ether (TPnB or TPGBE) 8-hour REL**

| | |
|---|---|
| *Reference Exposure Level* | **0.9 mg/m$^3$ (0.09 ppm)** |
| *Critical effects* | Relative and absolute organ weights, increased hepatocellular size and staining, and alterations in histopathology |
| *Hazard Index target* | Liver and kidney |

## 1 Physical and Chemical Properties

| | |
|---|---|
| *Physical form* | liquid |
| *Molecular Formula* | $C_{13}H_{28}O_4$ |
| *Structural Formula* | $C_4H_9$-(O-$CH_2$-CH-$CH_3$)$_3$-OH |
| *Molecular weight* | 248.4 g/mol |
| *Density (relative)* | $D_4^{20}$ = 0.930g/cm$^3$ |
| *Boiling point* | 274 ºC |
| *Melting point* | < -75 ºC |
| *Vapor pressure* | < 0.01 hPa |
| *Solubility in water* | 30 mg/l |
| *Conversion Factor* | 1 ppm = 10.326 mg/m$^3$ |

## 2 Production, Use, and Exposure

TPGBE is a solvent and coalescing agent used in architectural and industrial coatings, and in indoor decorative paints. It is also used as a solvent in heavy-duty cleaning formulations, oven cleaners, inks for ball-point and felt-tip pens and stamp pads, and in textile printing pastes.

# 3 Pharmacokinetics and Metabolism

No pharmacokinetic or metabolism information was found for TPGBE.

# 4 Acute Toxicity

Rat Oral Males $LD_{50}$ of 3,100 mg/kgbw (undiluted TPGBE);
Females $LD_{50}$ of 2,600 mg/kgbw (Debets, 1988) or 2,000 mg/kgbw (Wall, 1988)
LD50 ml/kgbw of 3,100 mg/kgbw (Rowe, 1954)
(All as cited in ECETOC, 2005).

No studies of short-term exposure to TPGBE were located that were appropriate for the derivation of an acute REL. While an $LC_{50}$ was reported, this value represents the upper limit for acute exposures that are compatible with survival without regard to protecting health. As such they are not appropriate for the derivation of an acute REL, which requires consideration of effects much less severe than lethality.

# 5 Repeated Dose Toxicity

Table 5.1 Repeated Dose Toxicity Test with TPGBE

| Studies | NOAEL | LOAEL | Effects | References |
|---|---|---|---|---|
| Subacute, F344 rats by gavage in corn oil (4 wk, 1 xd. 5 d/wk at 0, 100, 350, 1000 mg/kg-bw) | 350 mg/kg-bw | 1000 mg/kg-bw | Increased absolute and relative liver weights, altered hepatocellular staining | Mizell et al., 1990 as cited in ECETOC, 2005 |
| Subchronic, F344 rats in drinking water (13 wk, 7 d/wk, ad *libitum*, 0, 100, 350, 1000 mg/kg-bw) | 350 mg/kg-bw | 1000 mg/kg-bw | Histopathological and organ weight alterations of liver and kidney (m) or liver (f) | Kirk et al., 1992 as cited in ECETOC, 2005 |

# 6 Derivation of Interim 8-hour

In the course of an 8-hour exposure, intermittent spikes in exposure levels are included in the time-weighted average addressed with the 8-hr REL. The values associated with 8-hr RELs are typically lower than allowed for acute 1-hr exposures, due to the longer exposure duration and possibility of recurring exposures. Therefore application of the 8-hr REL to exposure scenarios involving short-term peaks in concentration should be health protective in most cases.

**Derivation of Interim 8-hour REL**

| | |
|---|---|
| *Study* | Mizell et al., 1990 and Kirk et al., 1990 |
| *Study population* | F344 rats |
| *Exposure method* | Gavage and drinking water, respectively |
| *Exposure continuity* | 1 x/d 5 d/wk and ad libitium 7 d/wk, respectively |
| *Exposure duration* | 4 wk and 13 wk, respectively |
| *Critical effects* | Increased absolute and relative liver weights, altered hepatocellular staining; altered liver and kidney weights and hispathology |
| *LOAEL* | 1000 mg/kg-day |
| *NOAEL* | 350 mg/kg-day |
| *LOAEL uncertainty factor ($UF_L$)* | Not applicable |
| *Subchronic uncertainty factor* | 3 |
| *Interspecies uncertainty Factor* | |
| *Toxicokinetic ($UF_{A-k}$)* | 2 |
| *Toxicodynamic ($UF_{A-d}$)* | √10 |
| *Intraspecies Uncertainty Factor* | |
| *Toxicokinetic ($UF_{H-k}$)* | 10 |
| *Toxicodynamic ($UF_{H-d}$)* | √10 |
| *Cumulative uncertainty factor* | 600 |
| *Oral dose* | 0.58 (350 mg/kg/d/600) |
| *Route to route extrapolation factor w/ chronic to 8-h adjustment* | 1.7 (58 kg/20 $m^3$/d) |
| *Chronic to 8-h adjustment* | (6/8 * 5/7) |
| *Reference Exposure Level* | **0.9 mg/$m^3$** |

The 8-hour Reference Exposure Level is a concentration at or below which adverse noncancer health effects would not be anticipated for repeated 8-hour exposures. This draft 8-hour REL is derived from two studies by Mizell et al. (1990) and Kirk et al. (1990) in F344 rats exposed by through oral gavage in corn oil (4 wk, 1 xd. 5 d/wk at 0, 100, 350, 1000 mg/kg-bw) or through drinking water (13 wk, 7 d/wk, ad *libitum*, 0, 100, 350, 1000 mg/kg-bw) (See Table 4.1). The animal studies have systemic endpoints of increased absolute and relative liver weights, altered hepatocellular staining; and histopathological and organ weight alterations of liver and kidney (m) or liver (f), respectively.

A LOAEL uncertainty factor was not used because a NOAEL was determined from the studies. In addition, a subchronic uncertainty factor was applied since this was a 13-week study. Significant differences in toxicokinetics between rats and humans are not expected to be large so a value of 2 was used for the interspecies toxicokinetics UF. In the absence of data, a default toxicodynamic UF of √10 was applied. Uncertainty factors for intraspecies variability were 10 for toxicokinetics and √10 for toxicodynamics in the absence of specific data. The cumulative UF is therefore 600, which gives an oral dose of 0.58 mg/kg/d. This value is converted to an inhalation dose by multiplying by the assumed human body weight (female = 58 g) and dividing

by the route adjustment (oral to inhalation 20 $m^3$/d). The time adjustment for the 8-hour REL used was 6/8 hours * 5/7 days/week. Oral to inhalation route adjustment and time-adjustment to a repeated 8-hour exposure thus give an 8-hour reference exposure level of 0.9 mg/$m^3$.

**Other Toxicity**

There are data on minor skin irritation and redness in rabbits following dermal TPGBE exposure while ocular exposure results in severe lachrymation and discharge with slight conjunctivitis and moderate swelling. TPGBE is not mutagenic/genotoxic in vitro (Ames test) or in vivo (micronucleus test) (ECETOC, 2005).

# 7 Environmental fate and effects

The manufacturer (Dow Chemical, 2007) suggests that Dowanol TPnB, of which TPGBE is 95%, is readily biodegradable, reaching >70% mineralization in OECD tests. They assert that the potential for bioconcentration is low (BCF < 100), but that mobility in soil is expected to be high (Koc between 0 and 50). No independent verification of these claims was located.

# 8 References

Dow Chemical (2007) MSDS DOWANOL* TPNB GLYCOL ETHER http://www.dow.com/PublishedLiterature/dh_0238/0901b8038023850b.pdf?filepath=/PublishTo Internet/InternetDOWCOM/msds/SDS_00010925_DOWANOLTPNBGLYETHER_UNITEDST ATES_ENGLISH&fromPage=MSDS

ECETOC (2005). The Toxicology of Glycol Ethers and Its Relevance to Man (Fourth Edition) Volume 2 Substance Profiles. Technical Report No. 95. European Centre for Ecotoxicology and Toxicology of Chemicals, Brussels, Beligum.

Key study cited in ECETOC (2005): Kirk HD, Yano BL, Haut KT, Verschuuren HG, Breslin WJ. 1992. Tripropylene glycol n-butyl ether: 13-week drinking water toxicity study in Fischer 344 rats. Unpublished report, study K-005-632-006. Toxicology Research Laboratory, Health and Environmental Sciences. Dow Chemical, Midland, Michigan, USA.

Key study cited in ECETOC (2005): Mizell MJ, Atkin L, Yano BL. 1990. Tripropylene glycol n-butyl ether: 28-day gavage toxicity study in Fischer 344 rats. Unpublished report, study K-005-632-005. Toxicology Research Laboratory, Health and Environmental Sciences. Dow Chemical, Midland, Michigan, USA.